ABSTRACT OF THE INVENTION

The present invention comprises imaging and quantitative measurement of lung ventilation, particularly in a human lung. Methods for quantitative imaging of lung ventilation, and the further provided systems and algorithmic tools therefor, comprise three primary components: the combined MRI ventilation/perfusion (V/Q) imaging techniques using hyperpolarized helium-3 (^{3}He) gas (H^{3}He); the three-dimensional quantitative imaging of absolute lung perfusion (Q) and collection of local magnetic resonance image data therefrom to produce an absolute lung perfusion image data; and the algorithmic co-registration of the two image data sets, (HP-^{3}He MRI image of V/Q and MR imaging of quantitative perfusion (Q) in the lung). From the data acquired in the combined data sets and their spatial co-registration, absolute ventilation (V) is computed.